

Space-Spurred Metallized Materials

A wide range of reflective insulating products heads a selection of spinoffs for consumer, home and recreational use

In the early days of the space program, NASA experimented with very large balloon-type satellites intended as orbital relay stations for reflecting communications signals from one point on Earth to another. NASA needed a special kind of material for the balloon's skin. In order to "bounce" the radio signals, it had to be highly reflective. It had to be inflatable in orbit to a diameter roughly equivalent to the height of a 10-story building, yet it had to be folded into a beach-ball size canister for launch from Earth—thus it had to be extraordinarily thin and lightweight.

The problem was solved by development of a metallized material, a plastic film coated with a superfine mist of vacuum-vaporized aluminum to create a foil-like effect. The metallic particles provided the required reflectivity and the balloon's skin was about half as thick as the cellophane on a cigarette package. The communications "bouncing" technique worked, but the concept was ultimately abandoned in favor of the active repeater type of communications relay employed in today's commercial satellite networks.

Metallized plastics might have gone nowhere had NASA not concurrently found another application: as a reflecting insulator, or thermal barrier, for protecting astronauts and sensitive spacecraft equipment from solar radiation and extremes of temperature. That triggered an ever-increasing demand for metallized products.

NASA did not invent metallization; in fact, the concept dates to the 19th century. But the NASA requirement proved to be the catalyst that transformed a small scale operation into a flourishing industry. Before NASA came on the scene, metallized plastics were being produced on a very limited scale for decorative purposes, but there was little that could be called a metallization industry. NASA's initial needs provided a relatively large market and inspired extensive research and development toward improvement of vacuum metallizing techniques. That led to an ever-expanding role for metallized material in space applications—virtually every U.S. spacecraft, manned or unmanned, has used the material—and the impetus thus provided spurred development of a broad line of commercial metallized products, from insulated outdoors garments to packaging for foods, from wall coverings to window shades, from life rafts to candy wrappings, reflective blankets to photographic reflectors.

One of the companies that worked with NASA on development of the original space materials is Metallized Products (MP), Winchester, Massachusetts. MP continues to supply metallized materials for a variety of space applications, but over more than a quarter of a century the company has developed an even broader spinoff line of industrial and consumer-oriented metallized film, fabric, paper and foam in single layer sheets and multilayer laminates. MP markets its own products and also supplies materials to manufacturers of other products.

A widely used MP product is TXG laminate, a material that originated in a NASA requirement related to ocean survival rather than orbital flight. In all manned space flights prior to the advent of the Space Shuttle, returning spacecraft descended by parachute to an ocean landing. On the surface, the astronauts left their spacecraft, boarded inflatable rafts and waited for pickup by ships or helicopters of the recovery fleet.



Often the wait was a long one, because the spacecraft on occasion splashed down as far as 250 miles from the nearest ship. To effect the quickest possible recovery, NASA asked MP to develop a highly reflective raft canopy whose mirrorlike sparkle could be seen at great distances or more readily detected by radar. MP's answer was the non-porous, waterproof, rotproof, superreflective TXG.

Subsequently, Winslow Company Marine Products, Osprey, Florida obtained a license for commercial production of the survival raft and, in cooperation with MP, improved the strength and thermal characteristics of the material so that the raft canopy would provide maximum protection from heat, cold, wind or rain. Winslow now offers TXG canopies on its line of oblong and circular survival rafts ranging in size from four to 12-person capacity.

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Among a score of applications for a space spinoff reflective material called TXG is the Emergency Blanket, manufactured by Metallized Products, here being used by a ski patrol to protect a skier shaken by a fall; the blanket retains up to 80 percent of the user's body heat, preventing post-accident shock or chills. Carried by many types of emergency teams, the blanket is large when unfolded but folds into a package no bigger than a deck of playing cards.



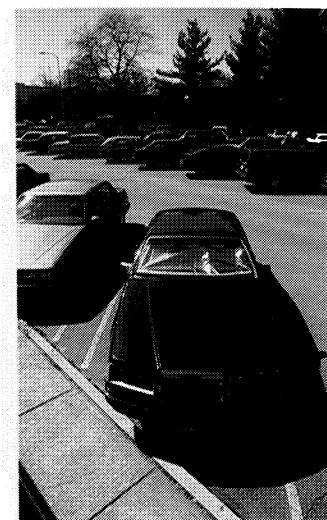
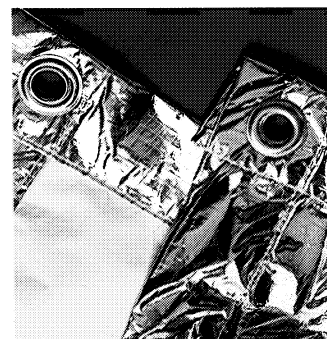
Shown above is an example of Thermoguard heat shields, windshield and window curtains that reflect the Sun's rays and protect long-parked aircraft from "greenhouse" heat buildup and ultraviolet radiation that could damage the plane's sensitive and expensive avionic equipment. Thermoguard shields are custom-tailored—by Connecticut Advanced Products—from TXG metallized fabric. The company also provides curtains for use on autos (above right). Late model cars have electronic equipment that needs protection, but the Thermoguard shield also protects against upholstery fade and dashboard splitting caused by a breakdown of chemicals in plastic dashboards from long exposure to the Sun. At top is a closeup of a TXG sample, shaded gold for extra reflectivity.

The TXG laminate has found broad and diverse employment. For example, it is used by Connecticut Advanced Products (CAP), Glastonbury, Connecticut for Thermoguard heat shields, custom-tailored reflective curtains that cover the windshield and windows of closed, parked aircraft to protect avionics equipment and upholstery from "greenhouse" heat buildup and ultraviolet radiation. CAP similarly uses TXG for protection of boats and road vehicles, and it manufactures a reflective survival blanket made of TXG.

Star Technology Corporation, Carbondale, Colorado employs TXG as a thermal barrier in its Starshade™, a multilayered automatic shade system for large windows in commercial or residential buildings. The standard system features an electric drive motor to raise or lower the shade, a flameproof fiberglass outer fabric and three layers of TXG, which combine with the fiberglass to provide exceptional insulation value.

Among the many other types of materials MP supplies to manufacturers is SP 27 Thermal Interlining, a material long used in space suits; it features a reflective barrier that prevents the passage of radiant energy, thus keeps heat from escaping from clothes or sleeping bags. It is used by many manufacturers of outdoor wear, such as jackets, pants, gaiters or gloves for climbers, campers and skiers.

Among MP's own products are a quartet of protective fabrics with different names but similar purposes: the Emergency Blanket, the Space® Brand Emergency Bag, the All-Weather Blanket and the Marathon Blanket; they reflect and retain up to 80 percent of the user's body heat, thus help prevent post-accident shock or post-exercise chills, or keep a person warm for hours in cold weather crisis situations. All are remarkably compact. The Space Bag, for example, opens into a three by seven foot personal tent/blanket but folds into a three-ounce package the size of a deck of playing cards. MP also produces the Even-Up® Tanning Blanket, which reflects the Sun's rays and disperses them to the hard-to-tan parts of the body.



Manufactured by Winslow Company Marine Products, the Winslow Radar Reflector Life Raft features a canopy made of TXG metallized nylon. The canopy serves dual purpose: it reflects the Sun's rays like a mirror, enabling radar or satellite sensors to spot survivors of a maritime accident at great distances, and it also provides thermal insulation to keep the occupants warm until rescued.



An example of an industrial-type product is MP's NRC-2 Super Insulation for handling of cryogenics, fluids—such as liquid hydrogen—that must be maintained at supercold temperatures. NRC-2 is an aluminum-coated polyester film with exceptional insulating qualities, used on the walls of cryogenic storage tanks, on pipes and valves, and on road tankers used to transport cryogenic fluids. ▲

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The windows of this home are fitted with Star Technology Corporation's Starshade automatic insulation system that includes an electric motor to raise or lower the shade. Intended for large windows in commercial or residential buildings, Starshade is a thermal barrier that bars or retains heat. The shade is made of three interior layers of TXG encased in an outer shield of flameproof fiberglass.

